

# CHAPTER I

## Part One

### THE PIANO

#### HISTORY

Development of the piano began with the need for a keyboard instrument capable of dynamic contrasts. The first piano was designed and built by the Italian harpsichord maker Bartolomeo Cristofori in Florence about 1720. It was called *il gravicembalo col piano e forte*, or *the harpsichord with soft and loud*. In shape it was very similar to the harpsichord. Although invented in Italy, the piano was developed in Germany where two different types of action were produced.

In the second half of the eighteenth century (c. 1760), several German piano makers settled in London. Gradually, the square shape of the grand piano they had brought with them was abandoned. This was due, in part, to the fact that the harpsichord, rather than the clavichord, was then the prevalent keyboard instrument in England.

John Broadwood, a leading British piano manufacturer, influenced the changes from German and Italian models to the English grand. It became heavier; two pedals were added; and the keyboard, instead of being recessed between the walls of the case, projected, exposing the performer's hands.

While a more modernized piano was being developed in England, the Austrians were creating a special type of piano: the *Stein-Streicher*, named for the manufacturer. It was a charming, delicate instrument similar in appearance to the harpsichord, with the musical sound and touch of the clavichord. Although excellent in its clarity and rapid response, it could not withstand the power and passion of the music of Beethoven and the later Romantics. For this reason, it was eventually discontinued.

Along with Italy, Germany, and England, Paris was a piano-making center from 1752 to 1831. Piano makers Sebastien Erard in France and Broadwood in England were largely responsible for the creation of the modern piano. Their alterations included heavier, thicker strings, a thicker soundboard, a greatly increased range, and a raised pitch. These developments made the resulting

tension on the strings (c. 20,000 kg.) too great for the piano's wooden frame. Steel bars and metal braces had to be used. Finally, an all cast iron frame was introduced, taking all the weight off the wooden parts.

Concurrently (c. 1821), a more responsive and reliable action the *double escapement*, was created by Erard. The 1st step in the evolution of the grand piano was the creation of the *overstrung scale*. This consisted of a new arrangement of the strings within the case. The treble strings diverged in the form of a fan, spreading across the largest part of the soundboard. The bass strings crossed over them at a slightly higher level. This resulted in a much more powerful piano and a fuller, more resonant harmonic sound, especially when the damper pedal (the right pedal) was depressed. This overstringing arrangement also removed some of the tonal clarity and transparency characteristic of earlier pianos. Consequently, certain full chords played in the middle to lower registers became undesirable because of the harmonic ambiguity or muddiness, especially when the damper pedal was used.

## **CURRENT USES**

The piano has a variety of functions today in the areas of legitimate or classical as well as popular music. It is used as a solo instrument and as part of an ensemble.

### ***Legitimate***

*Ensemble.* As part of a large ensemble, the piano is used in symphony orchestra and wind ensemble. It also plays an important role in chamber music or smaller instrumental ensembles.

*Accompanying.* An important function of the piano is to accompany vocalists, choral groups, or other instrumentalists.

*Solo.* As a solo instrument the piano is widely used for recitals and program settings. It is also used to perform concertos, arrangements, or transcriptions with symphony orchestras and wind ensembles.

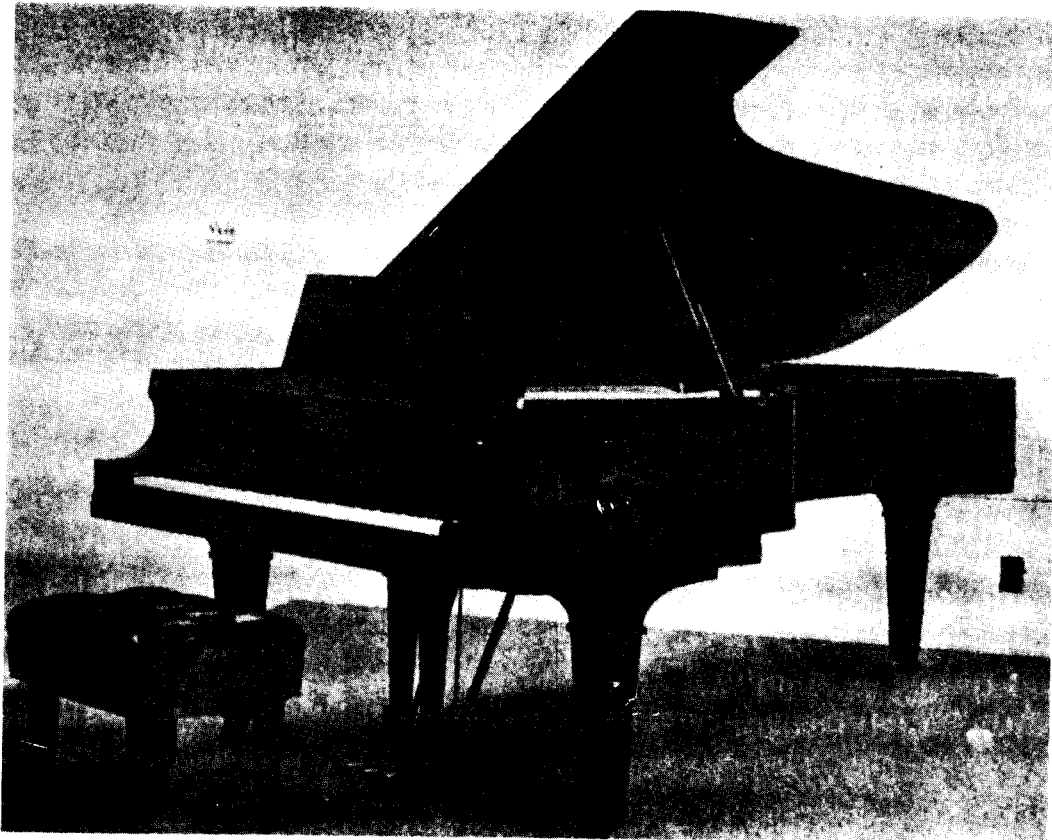
### **Popular**

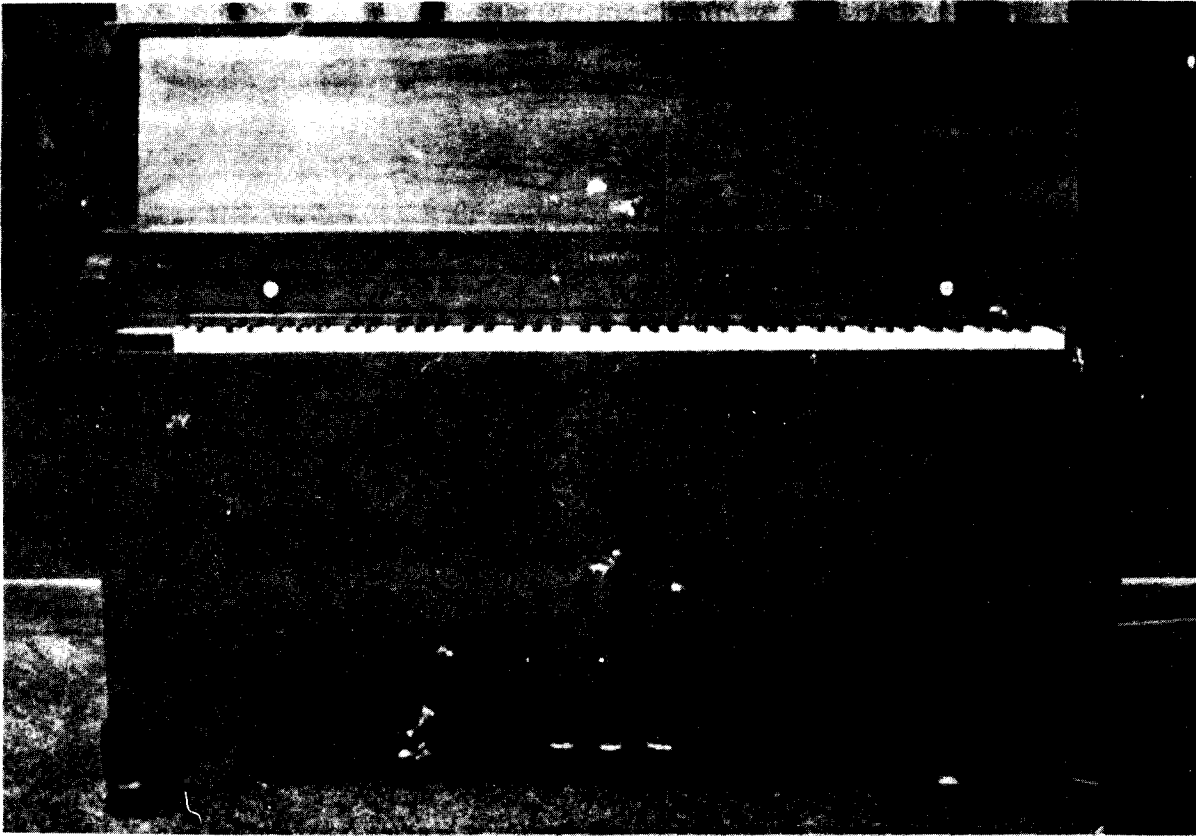
*Ensemble.* In popular music the piano, especially the electric, is used as a standard part of a combo and as part of the rhythm section of the stage or dance band. It may also be used as part of the band or orchestra for stage plays and musical comedies.

*Solo.* As a solo instrument the piano can be used to play cocktail or easy listening music, jazz, blues, or ragtime.

## TYPES OF PIANOS

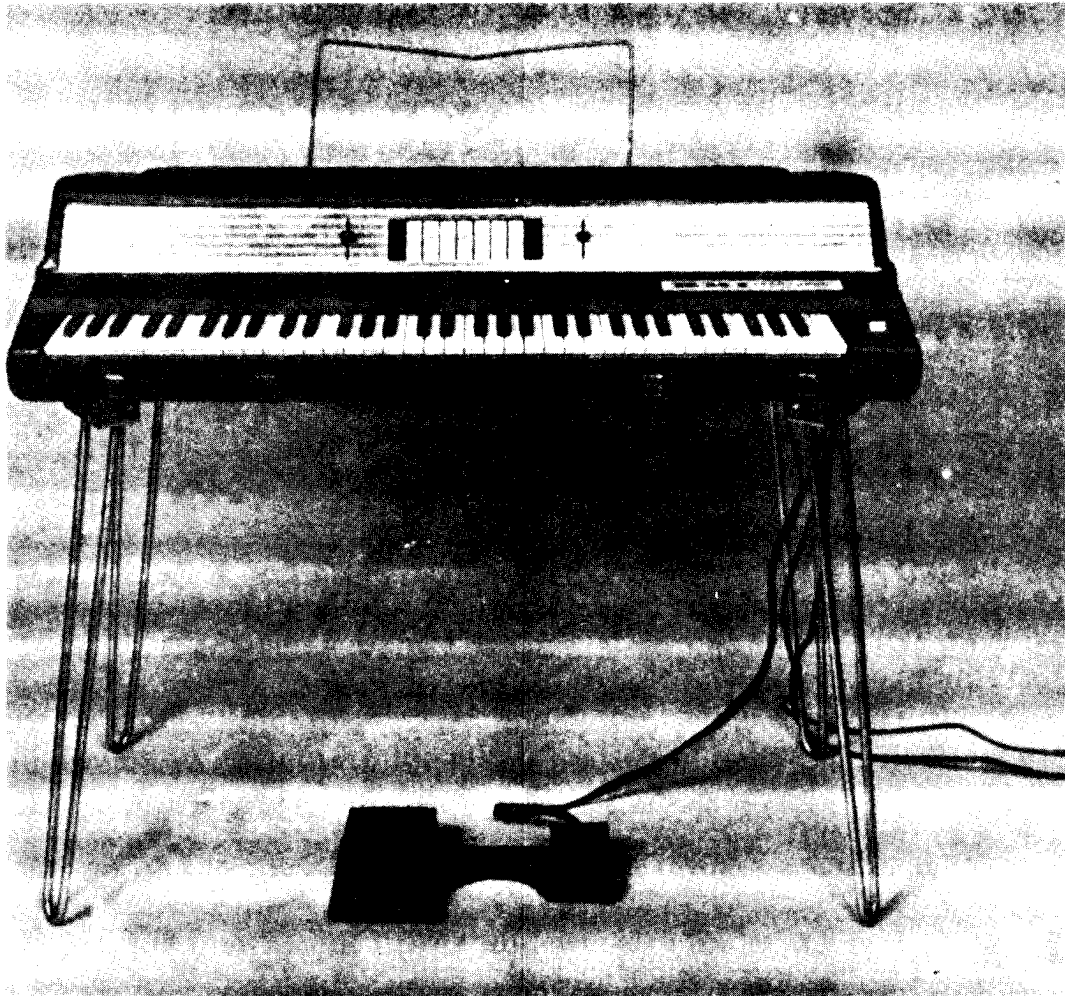
Basically, there are two different types of pianos in use today: the traditional or *acoustic* piano and the *electric* piano.





### *Acoustic*

The acoustic piano is of two types: the grand piano, which ranges in size from 5 feet 7 inches to 8 feet and more, weights from 600 pounds; and the upright piano which technically is from 40 inches to 60 inches high. Depending on the manufacturer, uprights may also be referred to as consoles. Consoles range in size from 37 inches to 44 inches. A smaller form of upright is the spinet which ranges from 30 inches to 36 inches in height, has shorter strings, and a shorter keyboard.



## ***Electric***

The electric piano differs from the acoustic piano primarily in its method of tone production. Instead of using hammers, strings, and soundboard, the tone is produced electronically by means of a tone generator (Yamaha, RMI) and then amplified electronically. In others the hammer strikes a mechanism (Wurlitzer - A Sandvik Swedish element. Fender-Rhodes - a tone bar or tuning fork and tine) which vibrates, producing the tone. The tone is then amplified electronically.

Most electric pianos are designed for ease in transporting, assembling, and disassembling. They weigh anywhere from 75 to 125 pounds and range from about 25 to 33 inches in height.

## CONSTRUCTION

### *Acoustic*

*Frame.* The frame helps support the tons of tension exerted by the stretched steel piano strings; it also acts to hold the unit together. It is usually made of oak boards or a combination of boards and iron bars.

*Soundboard.* The soundboard is a large wooden diaphragm, usually made of spruce, which is vibrated by the strings. The top (or front) is fitted with bridges connected to the strings. Wooden ribs are glued to the back, adding strength to the soundboard and helping to maintain its proper shape.

*Pinblock.* The pinblock is mounted above the soundboard in a vertical piano and in front of it in a grand. It is made of laminated hardwood and must support the tuning pins without cracking.

*Plate.* The plate covers the pinblock and the soundboard. It is usually made of cast-iron with holes to allow the tuning pins to protrude.

*Tuning Pins.* Tuning pins are anchored in the block. The strings are attached at one end to a tuning pin.

*Strings.* The bass strings are weighted and wrapped with copper or iron wire wound around the core wire. These strings are so thick that one string is loud enough for each note. The higher bass strings are thinner, requiring two strings per note. In the treble, each note has three strings, all tuned in unison. They vibrate together to produce the required volume.

*Action.* The action is the mechanism of the piano. It consists of a series of levers, starting with the *key* and ending with the *hammer* (the felt-covered piece of wood that strikes the string and produces the tone). It allows the pianist to play as loudly or softly and as quickly or slowly as desired.

For each key and hammer (except in the high treble) there is a *damper* which, when the key is up, rests on the strings and prevents them from vibrating. When the key is depressed, the damper lifts from the strings and allows them to vibrate. When the key is released, the damper returns to the string. In the high treble, the tone dies so quickly that no dampers are needed.

All piano actions also have some types of escapement mechanism, which allows the hammer to be released from the key just before hitting the string. After the hammer is released, it continues under its own inertia, hits the string, and then rebounds. When the key is released, the action returns to its original position and resets itself for another cycle.

*Pedals.* Most pianos have two pedals; some have three. The pedal on the right is the damper, which lifts all the dampers at once, allowing sounded notes to continue sounding after the keys are released.

The pedal on the left acts to mute or soften the tone and is sometimes referred to as the *una corda* pedal. In most grands this pedal shifts the entire action sideways, causing the hammers to strike only two strings of each triple unison and one of each double.

The third pedal, usually included on most grands and some better quality uprights, is called the *sostenuto* pedal. It sustains only those notes held down at the time the pedal is depressed. It can be used in conjunction with the damper pedal since it does not sustain any notes which are struck *after* depressing it. On many pianos, the middle pedal affects only the bass register. In this case, the pedal is called the bass *sustaining pedal*.

In uprights there is a middle pedal called a practice pedal. This pedal lowers a thick piece of felt between the hammers and the strings, muffling the tone.

## **Electric**

Because of the different designs and types of electric pianos, a detailed discussion of their construction is impractical here. The piano discussed here is the type most commonly found in Army bands.

*Action.* The action includes keys (same dimensions as on the acoustic piano), hammers, dampers, and escapement; in many respects it is similar to the action of the acoustic piano.

*Tone Generator Assembly.* This consists of the following:

*Tone Bar.* A twisted steel bar.

*Tine.* The bottom leg of the tuning fork consisting of a length of piano wire .075 in diameter, tapered by means of a special process to increase its durability.

*Tuning Spring.* A coil spring wound around the tine. The spring can be moved in either direction to tune the tine.

## **MAINTENANCE PROCEDURES**

Player maintenance of the piano is essentially confined to proper cleaning. While mechanical problems may be diagnosed, maintenance should be confined to the areas prescribed, unless a trained piano technician in the band has the permission of the bandmaster to exceed them.

### ***Piano Technician Maintenance***

Arrange for a competent piano technician to attend to the following areas:

*Tuning.* Involves adjusting the tension of each string to produce the correct frequency of vibration when sounded.

*Regulating.* Refers to adjustments of the action to make everything operate properly.

*Voicing.* The process of changing the tone quality by reshaping the hammers or making them softer or harder.

*Repair.* Includes gluing broken string, releasing a sticking key, etc.

*Refinishing.* Refers to restoring the exterior or other parts of the piano.

*Rebuilding.* Includes major reconditioning tasks such as replacing a set of hammers, recovering the key tops, restringing, restoring a cracked soundboard, etc.

### ***Preventive Maintenance (User)***

Preventive maintenance (PM) means taking care of the piano to keep servicing to a minimum. It includes: placing the piano to minimize the effects caused by changes in temperature and humidity by keeping it away from walls and direct sunlight; maintaining a *regular* schedule of tuning; and keeping the piano closed when not in use to protect it from dirt, dust and foreign objects.



## ***Acoustic Pianos***

*Each week*, clean the outside of the piano.

Dust the entire instrument with a clean, soft cloth.

Wipe the black keys with a soft, white cloth slightly dampened with plain water. Rub the keys lightly, avoiding excessive pressure. Do not snag the cloth on the keys.

Clean the white keys with a second piece of soft, white cloth. Follow the same procedure as cleaning the black keys.

Vacuum the keys to remove dust.

*Whenever necessary*, clean the inside of the piano.

Lift the top and remove the front panel on uprights, consoles, and spinets.

Remove debris from the action and action housing.

Dust the action and the area around it with the blowing nozzle of the vacuum cleaner.

Remove the bottom panel and clean debris from the interior.

Vacuum the interior.

Replace the panels.

Polish the instrument, as necessary, with a good quality furniture polish to remove stubborn spots and restore the finish.

*Once a month*, perform maintenance on the piano bench as follows:

Ensure that the music storage compartment is free from clutter.

Ensure that the lag bolts or nuts that secure the legs are tight.

Dust the bench.

Polish the bench with a good quality furniture polish.

Ensure that controls move smoothly and quietly.

*Never* attempt to clean the inside of the electric piano.

Refer suspected internal problems to a repairman.

Exercise care when moving the electric piano. Ensure that the following actions are performed.

Attach all covers firmly.

Remove electrical plugs carefully to ensure that wires remain intact.

### *Correcting Malfunctions*

Simple measures can solve some common mechanical malfunctions.

If keys are sticking and the atmospheric moisture is not excessive, check for liquids or solid objects dropped into the action or keys. If the cause or cure is not obvious, refer the malfunction to a technician.

If a key does not depress, do not use force. Check for foreign objects in the action, under the key, or between the key and the wippen.

If a key depresses but no sound comes forth, check for a broken action part or foreign objects in the action.

If a pedal squeaks, apply graphite to the moving connections. If the squeak persists, report the malfunction to supply for correction.

If the piano is out of tune, report the condition to supply for correction. Ensure that the piano is tuned *at least once every six months*. The optimum is having the piano tuned for each performance in which it is used.

### *Electric Pianos*

*Each week*, clean the outside of the electric piano as you would the acoustic. Additionally, you should:

Inspect for dents and scratches.

Remove legs and pack them securely.

Secure all latches.

Ensure that the keys are protected. Any object striking the keys can break the tone-producing tines.

Ensure that the piano is not dropped or heavily jarred.

Keep heavy objects off the piano.

### *Correcting Malfunctions*

electric and acoustic pianos can malfunction in similar ways.

Sticking keys are repaired in the same manner as those on the acoustic piano.

A key that does not depress is repaired in the same manner as one on the acoustic piano.

A key that does not produce a sound when depressed can result from an electrical malfunction as well as a mechanical problem. Check for foreign objects in the action and test for electrical continuity.

If a pedal squeaks, apply graphite to the moving connections but keep the graphite off the electrical connections. *Graphite can short electrical circuits.*

If the piano is out of tune, report the problem to supply for correction.

Servicing and maintenance is best done by following the manufacturer's guidelines. Follow the *User's Manual*, not the Technician's Guide and schematic diagrams.

*Selection and Maintenance of Pianos, published by United States Army Element, School of Music, contains much useful information on transportation, care, and selection of pianos. Consult this publication for further guidance.*

## Part Two

# THE GUITAR

### HISTORY

The guitar originated in The Near East. Nomadic Arabs carried its predecessors across Northern Africa into the Iberian peninsula, resulting in its traditional popularity in Spain and Portugal. Thirteenth century paintings depict various forms of the guitar. It was not until the 16th century, though, that guitar began to appear in Spanish classical music.

The guitar became highly popular in the 17th century. This was partly because the art of the lute was reaching artistic perfection at this time and the guitar was somewhat easier to play. Boccherini, Schubert, and other prominent composers wrote chamber music for the guitar. However, its use in classical music began to diminish until the turn of the 20th century when Francisco Tarrega and Andres Segovia initiated the revival of the classical guitar.

The use of the guitar in folk and popular music has never waned and it remains one of the most widely played instruments.

### TYPES

The types of guitars in common use can be generally classified as *acoustic*, *amplified*, *bass*, or *miscellaneous*.

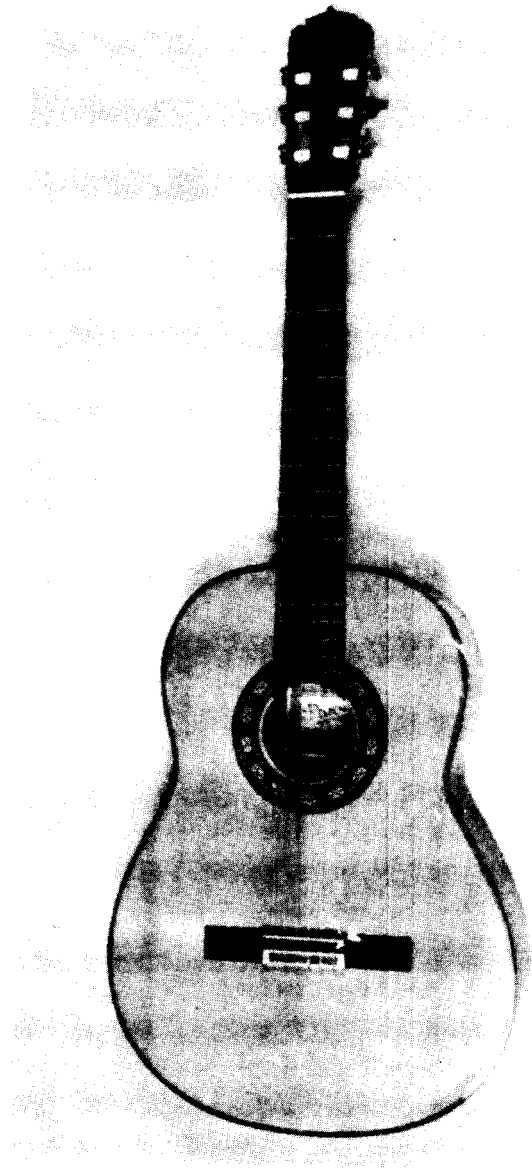
#### ***Acoustic***

***Flattop Spanish.*** This type includes most flattop round-hole guitars using *gut* or *nylon* strings.

**Classic.** The basic model. It is used by classical guitarists for solo and ensemble playing. The currently popular models are somewhat larger than those of several hundred years ago. Almost all have metal tuning machines. The better models are constructed largely of Brazilian rosewood, ebony, and spruce.

**Flamenco.** Very similar to the classic model except that most models have a clear plastic tap plate beneath the sound hole. The tap plate accommodates the percussive effects that flamenco artists use when

accompanying dancers. The trend is toward using machine heads but many flamenco guitars still have solid ebony or rosewood tuning pegs like a violin. The string height may be lower than that of the classic. The sides and back are often made of Spanish cypress instead of rosewood.



*Steel String.* Country, folk, and blues artists generally play steel string guitars, whether flattop or archtop.

**Flattop.** Looks much like a classic guitar but has substantial structural differences. The tuning machines are generally single, instead of in threes, and are stronger. The peghead has a simpler shape and many older models use slotted pegheads. The narrower neck allows the player to use his thumb to finger the frets.

**Twelve-String Flattop.** Used primarily for folk music. It has a wider neck than the six-string with six additional tuning machines and bridge pins. The larger models are the most popular and the most useful. The top two sets of strings (E and B) are tuned in unison and the bottom four sets are tuned in octaves.

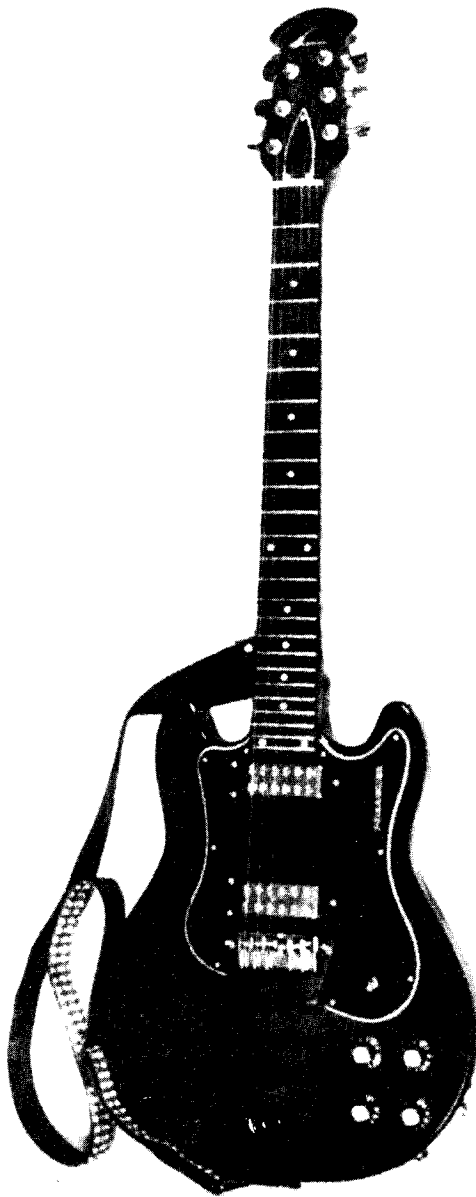
**Archtop (plectrum).** Now seldom used without amplification. Originally it was used solely as a rhythm instrument, but most jazz artists use it today as a solo instrument, in its amplified version. The strong arch of the top and back, along with F holes, tends to make the instrument more closely resemble a violin. Additionally, it has a tailpiece to relieve the strain of the highly-tensioned strings.

## ***Amplified***

This is the class of guitar primarily used by Army bandsmen. The major types are the hollow body and the solid body.

*Hollow-Body.* Usually of the archtop variety. Magnetic pickups are normally mounted in the top but pickups mounted on the pickguard allow a more acoustic guitar sound. Many hollow body guitars are thin, actually making them semi-acoustic.

*Solid-Body.* Has little inherent resonance and is dependent on its pickups. The lack of resonance gives the solid body a clean, pure sound preferred by some rock and combo guitarists. The solid wood construction facilitates the addition of various accessories.



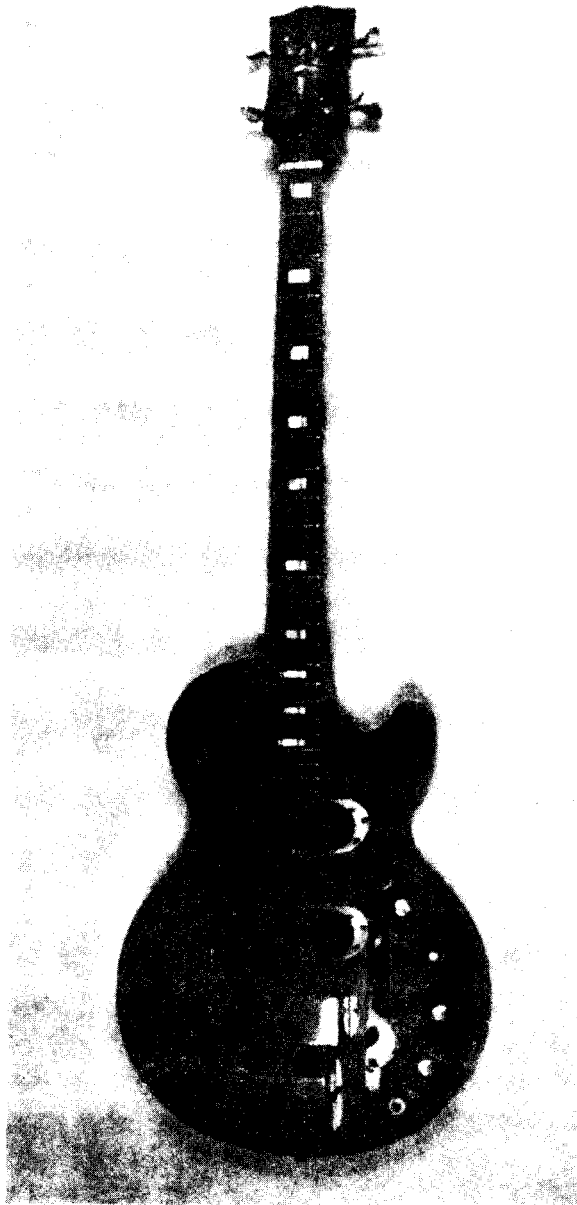
## ***Bass***

The third class of guitar includes the acoustic bass, the electric bass guitar, and the electric bass.

*Acoustic Bass.* Rarely used except in certain Latin bands. It is a huge guitar having six strings and a range an octave lower than the normal six-string guitar.

*Electric Bass Guitar.* Generally a solid body instrument. It is the best instrument for guitarists learning bass because the neck is about the same size as a guitar neck. It uses the bottom four strings of the guitar, sounding an octave lower.

*Electric Bass.* Somewhat different from the bass guitar in that the neck is longer and narrower, requiring a different playing technique.





## **Miscellaneous**

The fourth class includes instruments related to the guitar but seldom used by Army bandsmen.

*Ukelele.* Portuguese in origin. It resembles a miniature classical guitar with four strings. Although it is still popular in Hawaiian folk music, its use is very limited.

*Steel Guitar.* Used primarily in country bands. It is a box-like apparatus having no acoustical amplification. It is capable of long sustained tones and a characteristic glissando.

*Banjo.* Once very popular but now generally restricted to Dixieland, bluegrass, or nostalgia groups. The thumb is used in strumming, as well as the fingers, and the highest string (high G) is placed next to the lowest (low G) for this reason. The instrument has little sustaining capacity and requires a completely different playing technique from that of the guitar.

*Lute.* Still used somewhat in classical literature. Its descendant, the mandolin, is often used in Mediterranean-style music. Its technique is characterized by rapid single-note strumming.

## **ACCESSORIES**

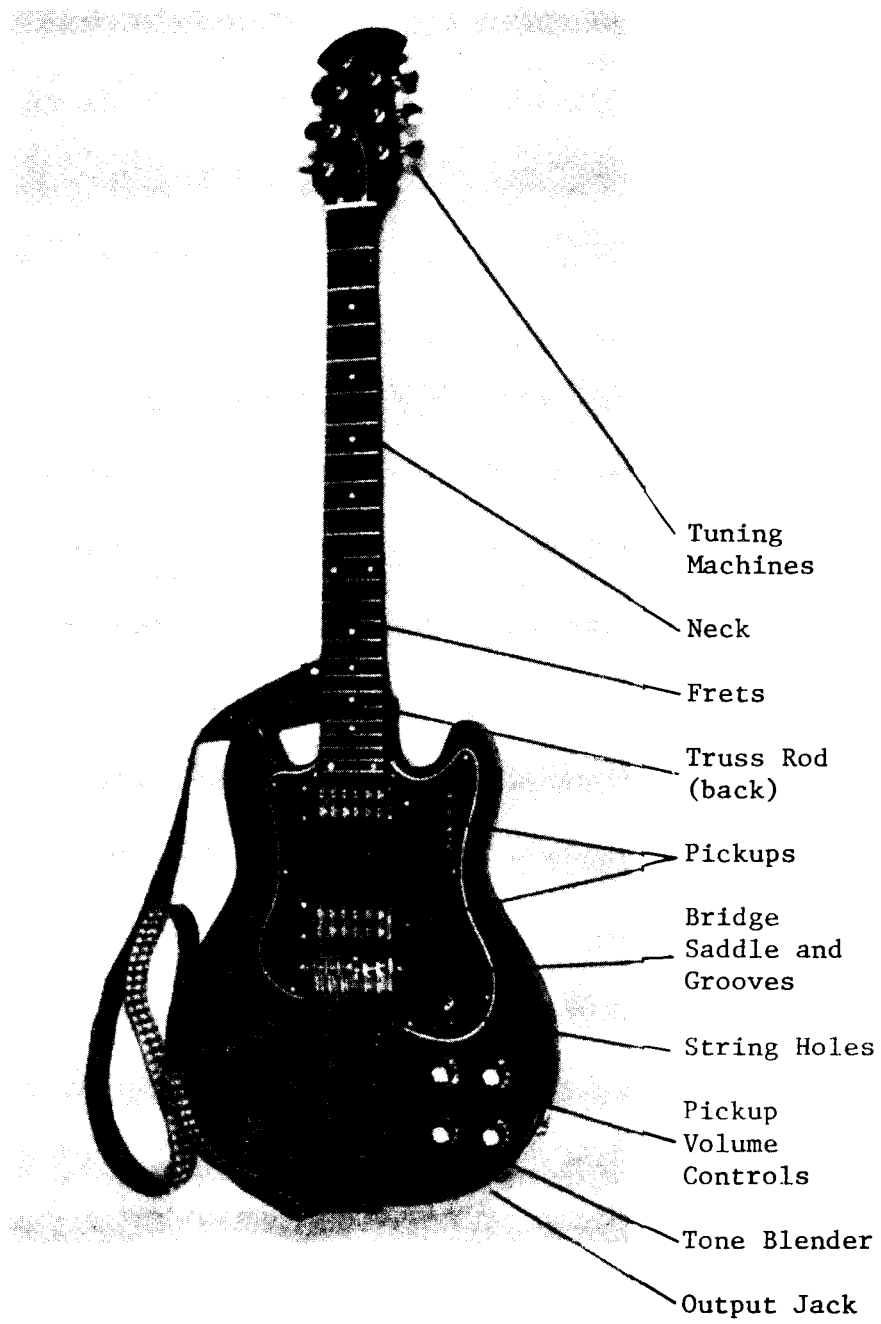
A variety of accessories and special effects are available to the guitarist. While only a few of them are discussed here, investigate all the effects you encounter. Some are worth the price but many are not. Do not purchase any accessory until you know what you want.

**Wah- Wah Pedal.** Creates the effect described by its name. Rapid use of the pedal results in a short WAH- WAH- WAH sound that can be effective on rock numbers if not overused. Applying the pedal slowly produces an ooo-uh-ah-ah-uh-ooo effect heard mainly on some soul rock tunes.

**Phase Shifter.** Creates what can best be described as a swirling sound. The speed can be adjusted but not as easily as the Wah-Wah pedal.

**Fuzz Box.** Creates a fuzzy, distorted sound, characteristic of acid rock.

## CONSTRUCTION



**Bridge Saddle and Grooves.** The strings are run over bridge saddle grooves in the bridge saddle to guide the strings along the neck in proper position. The bridge saddle can be used to adjust string height and harmonics.

*Height Adjustment Screws.* Used to adjust string height.

*Harmonic Tuning Screws.* Adjust the bridge saddle to bring the 12th fret octave in tune.

*Bridge Saddle Tension Spring.* Keeps constant forward tension on the bridge saddle.

*Base Plate.* The mounting apparatus for the bridge saddle, height adjustment, and harmonic adjustment screws.

**String Holes.** Strings are attached to the instrument by threading them through these holes.

**Output Jack.** A receptacle for a quarter-inch phone jack.

**Tone Blender.** Controls the balance and mix of the bass and treble pickups.

**Pickup Volume Controls.** Control the front and rear pickup gain.

**Pickups.** There are generally two pickups: one for bass and one for treble. They have height adjustment screws to regulate intensity.

**Frets.** Divisions of the fingerboard for note calibration. They may be made of wood or chrome nickel.

**Tuning Machines.** Adjust the intonation of the strings.

**Neck.** The fingerboard and frets are mounted on the neck. Its length determines the scale and calibration of the frets in conjunction with the bridge saddle.

**Truss Rod.** Reinforces the neck.

## **MAINTENANCE PROCEDURES**

Few guitar repairs can be accomplished by the average player without considerable risk to the instrument. Every guitar player should, however, be able to describe the function of each part on the guitar and electric bass and diagnose most malfunctions.

Players can correct these problems:

Worn strings may be indicated by pitting and corrosion. *Replace the strings.*

False strings produce out of tune harmonics. *Replace the strings.*

Mismatched strings produce different tone qualities and may be of different material and color. *Replace unwanted strings with matched ones.*

A dull, lusterless finish; rusted metal parts; or obvious dust and dirt mean you should *clean the instrument.*

Faulty pickup and pole-piece screw adjustment on electric guitars can be checked by pressing the first and sixth strings at the highest fret. *Each string should be about 1/16 inch above the pickup.* Set pole-piece screws *lower for thick, wound strings and higher for thin, unwound strings.*

If switches or knobs are noisy when the volume is up, contacts are probably dirty or corroded. *Apply contact cleaner.*

Loose screws on tuning machines, pickups, bridge, pick plate, output jack, cover, and neck plates may all be *tightened with a screwdriver.*

These problems require a competent guitar repairman for their correction:

Warped necks can be diagnosed by sighting down the neck from the nut to the body. Both neck and strings should be square and even with the body.

The neck can become unglued from the body. Look for a gap between the neck and body.

The neck may bow up. Check the side view of the guitar from the nut to the body.

A bridge starting to pull loose will create a space along one side of the bridge.

Worn frets have grooves caused by string friction.

A nut is badly worn if the grooves are deeper than half the string diameter.

A broken nut has cracks on or around it.

The bridge saddle may be worn or maladjusted if the instrument is in decent condition but the string height on the fingerboard is not close to 1/8 inch.

Any problem not described here should be referred to a repairman. Electrical malfunctions should also be referred because of the danger of electrical shock.

## CLEANING

To clean guitars and electric basses, observe the following procedures:

Use a soft, dry cloth to wipe strings, neck, body, and pickups of the instrument.

Apply a furniture or guitar polish to the back of the neck and the entire body. *Do not* get polish on the fingerboard, strings, or electronic parts.

Wipe all grime from the tuning machines, then apply a lightweight oil *sparingly*. Use the same procedure for the bridge adjustment gears. These parts, if clean, may need lubrication only semiannually.

To replace strings, observe the following procedures:

Change one string at a time, beginning with the largest.

Attach the ball end of the string to the tailpiece or bridge.

Insert the other end through the tuning post.

Allow enough excess to wind the string around the post at least three times to bring it up to pitch.

Snip off the surplus with wire cutters.

Bring strings up to pitch very slowly to give them a chance to stretch.

To store the guitar or bass, loosen the strings about a *major third or perfect fourth*. Pack the guitar securely, avoiding extremes of heat and humidity.